UNIVERSITY OF JOHANNESBURG

**DEPARTMENT OF ECONOMICS AND ECONOMETRICS**
**DEPARTEMENT EKONOMIE EN EKONOMETRIE**
**FINAL ASSESSMENT NOVEMBER 2015**

**Course:** Econometrics 3B

**Assessor:** Mr JJ Kouadio

**Internal Moderator:** Ms MK Wilson
**External Moderator:** Ms NS Cattaneo

**Time:** **180** minutes

**Marks:** **100**

*This paper consists of 15 pages*

*Answer all the questions. An Excel file is provided, with different sheets. Use the Excel file provided for some of the questions. The Excel sheets are labeled after each question. Round your answers to four decimal places*

**Surname & Initials** _____

**Student number** _____

**Cellphone number** _____

| **Question** | **Total** | **Mark** |
|---|---|---|
| **1** | **10** | |
| **2** | **20** | |
| **3** | **20** | |
| **4** | **20** | |
| **5** | **20** | |
| **6** | **10** | |
| **Total** | **100** | |

***QUESTION 1*** ***[10 marks]***

***State with reasons whether the following statements are true, false, or uncertain. Be precise.*** *[2 marks each]*

*1.1. An assumption of the Classical Linear Regression Model (CLRM) is that the variance of the error term should depend on the value of X (the regressor).*

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*1.2. Even though the disturbance term in the CLRM is not normally distributed, the OLS estimators are still unbiased.*

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*1.3. If a null hypothesis is not rejected, it is true.*

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*1.4. For a random walk stochastic process, the variance is finite.*

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*1.5. If an explanatory variable in a regression model is correlated with the stochastic disturbance term, the OLS estimators are not only biased but also consistent.*

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***QUESTION 2*** **[20 marks]**

*2.1. Derive the mathematical expression for the OLS estimators in the following models. Show all the steps.* *[8 Marks]*

$$Y_i = \beta_1 + \beta_2 X_i + u_i$$

*2.2. Consider the following regression model:*

$$\boldsymbol{Y_i = \beta_1 + \beta_2 X_i + u_i}$$

*Where X = family income and Y =1 if the family owns a house and 0 if it does not own a house.*

*Explain why this model is called a* ***Linear Probability Model.*** *[4 marks]*

*2.3. Explain the connection between cointegration and spurious regression.* *(4)*

*2.4. What is the error correction mechanism (ECM)? What is its relationship with cointegration?* *(4)*

***QUESTION 3*** ***[20 marks]***

*3.1. Briefly explain the simultaneity bias problem.* *(3)*

*3.2. You are given the following simple Keynesian model of income determination.*

$$C_t = a_0 + a_1 Y_t + u_{1t}$$
$$I_t = b_0 + b_1 Y_t + b_2 Y_{t-1} + u_{2t}$$
$$Y_t = C_t + I_t + G_t$$

*i. Write down the reduced form of the behavioural equations. (6)*

*ii. Establish the identification state of each of the structural equations, using both the rank and the order conditions. (7)*

*iii. What is the identification state of the entire model?* *(2)*

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*iv. What estimation method is appropriate for each of the structural equations?* *(2)*

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***QUESTION 4*** ***[20 marks]***

*Use the data provided in the Excel worksheet Question 4.xls to answer some of the questions below.*

*Assume that:*

$$\boldsymbol{logM3_t = \alpha + \beta logGBY_t^* + u_t}$$

*where: M3 is real demand for money and* $GBY_t^*$ *is the expected long-term interest rate, both in natural logarithms.*

*Since the expected interest rate (*$lnGBY_t^*$*) is not directly observable, the following hypothesis about how expectations are formed is proposed.*

$$\boldsymbol{logGBY_t^* - logGBY_{t-1}^* = \gamma(logGBY_t - logGBY_{t-1}^*)}$$

*where* $\gamma$ *is the expectation coefficient.*

*4.1. Explain the expectations hypothesis.* *(2)*

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*4.2. Use the hypothesis to generate (derive) the short run money demand function. Show all your workings. (6)*

*4.3. Estimate the short-run money demand model obtained in 4.2. and write down your regression results. (3)*

*4.4. Calculate the long-run money demand function. Write down the long run equation. (3)*

*4.5. Interpret the estimated coefficients of both your short-run and long-run money demand function, as well as the estimated expectations coefficient. (6)*

***Question 5*** **[20 marks]**

*You are provided with monthly data for short term and long term interest rates in SA in the Excel worksheet Question 5.xls.*

*5.1. What is the a priori expectation of the relationship between the two variables? Explain. (2)*

*5.2. Determine the order of integration of short term and long term interest rates. Report all your results. (4)*

*5.3. Perform a regression of the two variables[1] and use Granger and Newbold's rule of thumb to check if the regression is spurious. (3)*

*5.4. Is there a long-run relationship between these two variables? Explain. (5)*

[1] *Be clear what the dependent variable is*.

*5.5. Determine and interpret the short-run relationship between these two variables. (3)*

*5.6. State the drawbacks of the Engle-Granger (EG) cointegration approach. (3)*

***Question 6*** **[10 Marks]**

*From data for 54 standard metropolitan statistical areas (SMSA), Demaris estimated the following logit model to explain high murder rate versus low murder rate:*

$$\widehat{lnO_i} = 1.1387 + 0.0014P_i + 0.0561C_i - 0.4050R_i$$

$$Se = \quad (0.0009) \quad (0.0227) \quad (0.1568)$$

*Where **O** = the odds of a high murder rate, **P** = 1980 population size in thousands, **C** = population growth rate from 1970 to 1980, **R** = reading quotient, and **Se** are the asymptotic standard errors.*

*6.1. Which of the coefficients are statistically significant? Why? (4)*

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*6.2. What is the effect of a unit increase in the reading quotient on the odds of having a higher murder rate? (3)*

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*6.3. What is the effect of a percentage point increase in the population growth rate on the odds of having a higher murder rate? (3)*

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